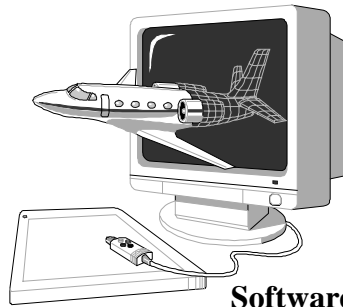# FAA National Software Conference, June 2001
Software Conformity

Guidelines for
Software Conformity Inspection and
Software Conformity Review
Notice 8110.86

Will Struck
ANM-111
425-227-2764
will.struck@faa.gov

Software Standardization
Conference
June 5, 2001

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Background

- **Terminology**
- **Who performs what, when**
- **Standardization**

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Objectives

- **Explain relationship of Notice 8110.86 to FAA Order 8110.4B & RTCA DO-178B**
- **Differentiate between software conformity inspection and software conformity review**
  - **Characteristics**
  - **Responsibilities**
  - **Documentation**

3

Based in Rule

- **14 CFR Part 21, Section 21.33 Inspection and Tests (b):**
  - *"(2) That materials and products conform to the specifications in the type design; (3) That parts of the products conform to the drawing in the type design; and (4) That the manufacturing processes, construction and assembly conform to those specified in the type design."*

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Amplified in FAA Order (1/2)

- **FAA Order 8110.4B, Paragraph 2-11f: Conformity & witnessing of tests**
  - *"The conformity of the test article, test setup, test procedures used, and the validity of the test results must be established for each test conducted to show compliance with a type certification requirement . . ."*

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Amplified in FAA Order (2/2)

- **FAA Order 8110.4B, Paragraph 2-11g: Conformity Inspections**
  - *"A conformity inspection is required to ensure that the product being certificated complies with the type design. . . . An FAA conformity inspection should be successfully conducted before any official FAA tests (ground or flight) are conducted. . . ."*

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Responsibilities (1/2)

- **FAA Engineering Personnel**
  - Requests required for conformity inspections are documented
    - FAA Form 8120-10, Request for conformity
    - FAA Form 8110-1, Type Inspection Authorization
    - Memorandum

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Responsibilities (2/2)

- **FAA Manufacturing Personnel**
  - Determines that product conforms with drawing specifications and special processes
  - Assures software part number and version number is identifiable, under configuration control, reproducible, and documented
  - Documents a FAA Form 8100-1, Conformity Inspection Record

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Order 8110.4B & RTCA DO-178B

- **Order 8110.4B**
  - "… establishes procedures for accomplishing the evaluation and approval of aircraft type design data …"
- **RTCA DO-178B**
  - "… provide guidelines for the production of software for airborne systems and equipment that performs its intended function with a level of confidence in safety …"

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Official FAA Tests (Order 8110.4B)

- *"… An FAA conformity inspection should be successfully conducted before any official FAA tests (ground or flight) are conducted. . . ."*
- In other words, any test in which certification credit is taken

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Baseline:
An important prerequisite to testing for credit

- **RTCA DO-178B**
  - "The approved, recorded configuration of one or more configuration items, that thereafter serves as the basis for further development, and that is changed only through a change control process."
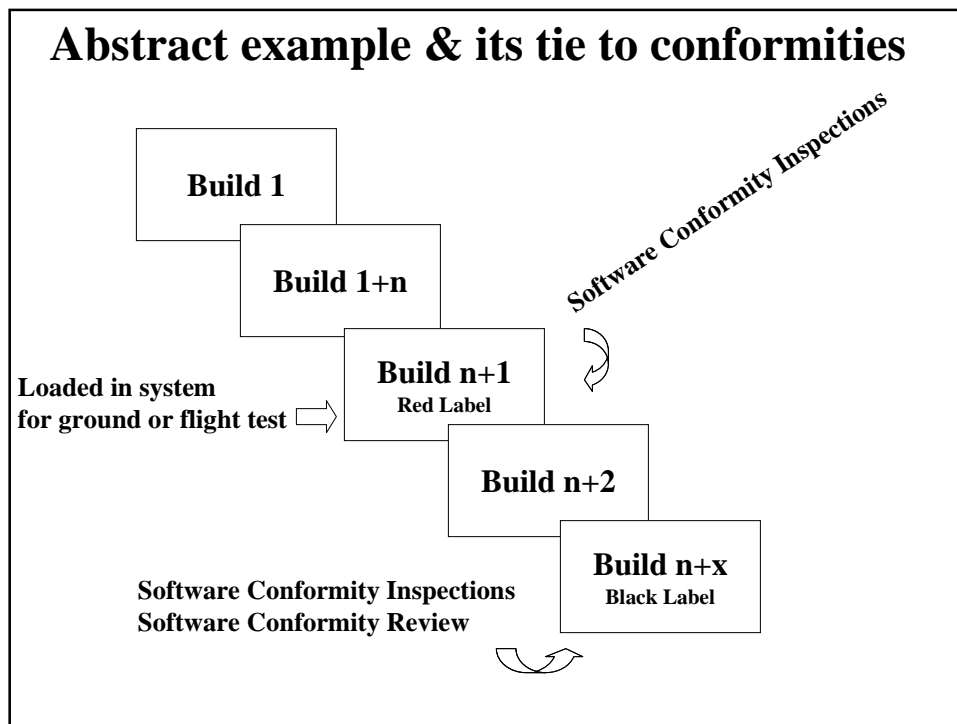
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Understanding types of baselines

- **Black Label**
  - Final baseline
- **Red Label**
  - Any baseline that precedes final baseline

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Abstract example & its tie to conformities

Build 1

Build 1+n

Software Conformity Inspections

Build n+1
Red Label

Loaded in system
for ground or flight test ⇨

Build n+2

Build n+x
Black Label

Software Conformity Inspections
Software Conformity Review

Notice 8110.86

- GUIDELINES FOR SOFTWARE
  CONFORMITY INSPECTION AND
  SOFTWARE CONFORMITY REVIEW

  1. Purpose
  2. Distribution
  3. Related Publications
  4. Background
  5. *Discussion and Procedures*
  6. Conclusion

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Section 5
Discussion & Procedures

1 **Design Assurance Software Conformity Inspection**

2 **Software Installation Conformity Inspection**

3 **Software Conformity Review**

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1. Design Assurance Software Conformity Inspection (1/7)

- **To ensure that the test configuration of the software complies with its test baseline before a test for credit is executed**
  - **Aircraft**
  - **Test Laboratory**
  - **Development Workstation**

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Further Guidance (Design Assurance) (2/7)

- **8110.4B**
  - **Conformity and witnessing of tests**
    - **Paragraph 2-11f(4)**
  - **Areas of consideration pertaining to software**
    - **Paragraph 5-2d(9)**
  - **Witnessing of official tests**
    - **Paragraph 5-5**

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Design Assurance Software Conformity Inspection (3/7)

- **DO-178B Software Configuration Management process utilized for assurance**
  - **Integral process**
    - – Plan and records in place
    - – Visibility to a defined and controlled configuration
    - – Known point of review
    - – Evidence of approval
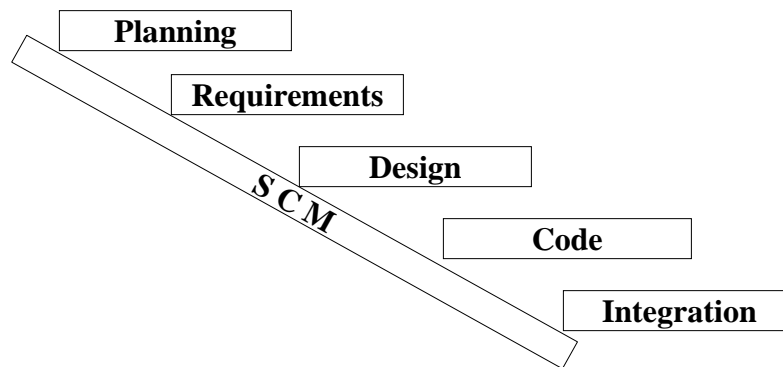   - – Control, archival, and recovery

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Configuration Management (4/7)

Planning

Requirements

Design

Code

Integration

S C M

Design Assurance Software Conformity Inspection (5/7)

- **Requires:**
  - – **Baseline that identifies relevant software life cycle data**
  - – **Development/Verification tools**
  - – **Procedures used for retention, archival, & retrieval is compliant to the SCMP**

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Design Assurance Software Conformity Inspection (6/7)

- Requires:
  - ACO ASE has concurred the baseline complies to its requirements and approved software plans. Or,
  - DER approval via FAA Form 8110-3
    - (unchanged code is not effected, changed code does not impact unchanged code and is of a design appropriate for its intended function)

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Design Assurance Software Conformity Inspection (7/7)

- Requires ASI to assure:
  - Baseline identifies relevant life cycle data
  - Completion of FAA Form 8110-3, Statement of compliance
  - Tool configuration is documented
  - Compliance with SCMP for retention, archival, and retrieval processes

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2. Software Installation Conformity Inspection (1/6)

- **When?**
  - After a Design Assurance Conformity Inspection
  - During or after the software is loaded
    - Line Replaceable Unit
    - System
  - Before any official FAA ground or flight test

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Software Installation Conformity Inspection Objectives (2/6)

- **Assures:**
  - Approved/controlled version of software
  - Approved/controlled version of hardware
  - Successful loading of software into hardware
  - Use of approved procedures
    - software loading procedures
    - system installation procedures
  - Software initializes successfully

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Software Installation Conformity Inspection Methods (3/6)

ASI/Designee performs by one of two methods:

- – Witnessing all aspects of the actual software installation, or
- – Review of manufacturing inspection records, documenting the results of the actual software installation

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Software Installation Conformity Inspection Witness (4/6)

ASI/Designee can witness all aspects of the actual software installation :

- – Physical verification of correct software and hardware
- – Successful loading of software into hardware
- – Integrity check to verify load
- – Successful software initialization

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Software Installation Conformity Inspection Review (5/6)

ASI/Designee can review manufacturing inspection records documenting:

- Hardware part number/serial number
- Software part number/version number
- Traceability to system installed in aircraft
- Successful loading of software into hardware
- Results of integrity check to verify load
- Successful software initialization

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FAA Form 8100-1, Conformity Inspection Report (6/6)

Conformity Inspection Record		1. Project Number, TIA/Request Date:		2. SHEET of Sheets	
3. Applicant/Manufacturer:			4. Beginning Date:	5. Ending Date:	
6. Model:			7. Inspected By:		
8. Item No.	9. Nomenclature of Item Inspected	10. Drawing, Document, Specification, etc.	11. Revision and Date	12. No. of Items Determined SAT. UNSAT.	13. Comments

FAA Form 8100-1   (5-98)   Superseded Previous Edition   (Electronic Format 2-99)

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Software Conformity Review (1/3)

- **Referenced in RTCA DO-178B Section 8.3**
- **Applicant's responsibility**
- **Not performed by an ASE, ASI, or Designee**

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Software Conformity Review Objectives (2/3)

- **Assure:**
  - **Software life cycle data process activities are complete**
  - **Data complies with plans and standards**
  - **Problem reports comply with the SCM Plan**
  - **Executable code can be regenerated**
  - **Approved software can load successfully**

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Software Conformity Review (3/3)

- **Assure software life cycle data are complete**
  - Software Requirements Data
  - Design Description
  - Source Code
  - Executable Object Code
  - Software Configuration Index
  - Software Accomplishment Summary

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Summary

- **Three types of software conformities**
  - 2 inspections
  - 1 review
- **FAA role**
- **Based on Rule**

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